

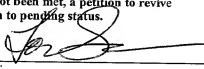
FORM PTO 1590 (REV 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER M1401.0002/P002	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 107018749	
INTERNATIONAL APPLICATION NO. PCT/JP00/04349		INTERNATIONAL FILING DATE 30/06/2000		PRIORITY DATE CLAIMED 2 July 1999	
TITLE OF INVENTION IMAGE RECOGNITION DEVICE, IMAGE FORMING DEVICE, AND RECORDED MEDIUM					
APPLICANT(S) FOR DO/EO/US Takashi Kakiuchi, et al.					

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
- ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing 35 U.S.C. 371
- ☒ This is an express request to begin national examination procedures (35 U.S.C. 371 (f)). The submission must include items (5), (6), (9) and (21) indicated below.
- ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
- ☒ A copy of the International Application as filed (35 U.S.C. 371 (c)(2))
 - ☐ is attached hereto (required only if not communicated by the International Bureau).
 - ☒ has been communicated by the International Bureau.
 - ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
- ☒ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
 - ☒ is attached hereto.
 - ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
- ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - ☐ are attached hereto (required only if not communicated by the International Bureau).
 - ☐ have been communicated by the International Bureau.
 - ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - ☒ have not been made and will not be made.
- ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
- ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
- ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11 to 20 below concern document(s) or information included:

- ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
- ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- ☐ A **FIRST** preliminary amendment.
- ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
- ☐ A substitute specification.
- ☐ A change of power of attorney and/or address letter.
- ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
- ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
- ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
- ☒ Other items or information: PCT/RO/101+105; PCT/ISA/202+210+220; PCT/ISA/416+409+401; WO 01/03417 (cover page); PCT/IB/308+306+332+301+304; English translation of amendment under PCT Article 34

U.S. APPLICATION NO. 10/018749 INTERNATIONAL APPLICATION NO. PCT/JP00/04349	ATTORNEY'S DOCKET NUMBER M1401.0002/P002																																																																	
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00																																																																		
ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 890.00																																																																		
Surcharge of \$ _____ for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).																																																																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">CLAIMS</th> <th style="width: 20%;">NUMBER FILED</th> <th style="width: 20%;">NUMBER EXTRA</th> <th style="width: 20%;">RATE</th> <th style="width: 20%;"></th> </tr> </thead> <tbody> <tr> <td>Total claims</td> <td>5-20 =</td> <td></td> <td>x</td> <td>\$ 0.00</td> </tr> <tr> <td>Independent claims</td> <td>4-3 =</td> <td>1</td> <td>x</td> <td>\$ 84.00</td> </tr> <tr> <td>MULTIPLE DEPENDENT CLAIM(s) (if applicable)</td> <td></td> <td></td> <td>x</td> <td>\$ 280.00</td> </tr> <tr> <td colspan="4">TOTAL OF ABOVE CALCULATIONS =</td> <td>\$ 1,254.00</td> </tr> <tr> <td colspan="4"> <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. </td> <td>\$</td> </tr> <tr> <td colspan="4">SUBTOTAL =</td> <td>\$ 1,254.00</td> </tr> <tr> <td colspan="4"> Processing fee of \$ _____ for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). </td> <td>\$</td> </tr> <tr> <td colspan="4">TOTAL NATIONAL FEE =</td> <td>\$ 1,254.00</td> </tr> <tr> <td colspan="4"> Fee for recording the enclosed assignment (37 CFR 1.21 (h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31) (\$40.00 per property). </td> <td>\$ 40.00</td> </tr> <tr> <td colspan="4">TOTAL FEES ENCLOSED =</td> <td>\$ 1,294.00</td> </tr> <tr> <td colspan="4"></td> <td>Amount to be Refunded: \$</td> </tr> <tr> <td colspan="4"></td> <td>Charged: \$</td> </tr> </tbody> </table>		CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		Total claims	5-20 =		x	\$ 0.00	Independent claims	4-3 =	1	x	\$ 84.00	MULTIPLE DEPENDENT CLAIM(s) (if applicable)			x	\$ 280.00	TOTAL OF ABOVE CALCULATIONS =				\$ 1,254.00	<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	SUBTOTAL =				\$ 1,254.00	Processing fee of \$ _____ for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$	TOTAL NATIONAL FEE =				\$ 1,254.00	Fee for recording the enclosed assignment (37 CFR 1.21 (h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31) (\$40.00 per property).				\$ 40.00	TOTAL FEES ENCLOSED =				\$ 1,294.00					Amount to be Refunded: \$					Charged: \$
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE																																																															
Total claims	5-20 =		x	\$ 0.00																																																														
Independent claims	4-3 =	1	x	\$ 84.00																																																														
MULTIPLE DEPENDENT CLAIM(s) (if applicable)			x	\$ 280.00																																																														
TOTAL OF ABOVE CALCULATIONS =				\$ 1,254.00																																																														
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$																																																														
SUBTOTAL =				\$ 1,254.00																																																														
Processing fee of \$ _____ for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$																																																														
TOTAL NATIONAL FEE =				\$ 1,254.00																																																														
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31) (\$40.00 per property).				\$ 40.00																																																														
TOTAL FEES ENCLOSED =				\$ 1,294.00																																																														
				Amount to be Refunded: \$																																																														
				Charged: \$																																																														
a. <input checked="" type="checkbox"/> A check in the amount of \$ 1,294.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to my Deposit Account No. 04-1073 . A duplicate copy of this sheet is enclosed.																																																																		
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.																																																																		
SEND ALL CORRESPONDENCE TO: Thomas J. D'Amico DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP 2101 L Street NW Washington, DC 20037-1526 (202) 828-2232																																																																		
SIGNATURE:  NAME: Thomas J. D'Amico REGISTRATION NUMBER: 28,371																																																																		

10018749-72301

TITLE OF THE INVENTION

IMAGE RECOGNITION DEVICE, IMAGE FORMING DEVICE,
AND RECORDING MEDIUM

TECHNICAL FIELD

The present invention is related to an image recognition device, an image forming device, and a recording medium. More specifically, the present invention is related to technology which makes it possible to effectively suppress the output of prohibited output items.

PRIOR ART TECHNOLOGY

In prior art image processing systems for opposing the counterfeiting of banknotes, valuable securities and the like, various devices have been proposed and implemented in closed systems, such as color copying machines, from image input to image formation. In this case, in such closed systems, a recognition is carried out using data read out from the genuine document (prohibited copying item such as a banknote or the like) in the image input portion, and using these results the output is stopped in the image formation device.

On the other hand, as for the fate of such recognition technology, it is impossible to avoid the problem of mis-recognition. This mis-recognition includes two situations comprised of the case where it is not possible to carry out recognition in spite of the fact that an image is a detection object, and the case where an image that is not a detection object is mistakenly recognized as a detection object. To take a prohibited copying item such as a banknote or the like as an example, there is the case where a copying process is tried for a

banknote placed on the document support base and a copying output is carried out without it being possible to recognize the banknote (former case), and the case where, when attempting to copy an ordinary document that is not a banknote, a normal copying process is prohibited because the image is mis-recognized as a banknote (latter case).

Further, because the recognition process for a detection object such as a banknote or the like originally adjusts the recognition algorithm for recognizing such banknote or the like, the probability of a recognition omission is low even when there are slight changes or the like of the image. In this regard, there is a great variety of images which are not detection objects, and it is substantially difficult to construct algorithms and knowledge that can consider all of these in advance and not carry out recognition. Accordingly, with regards to the kinds of mis-recognition described above, the latter case where an image that is not a detection object is recognized as a detection object has a higher probability of occurring.

Further, in the case of an image that is not such detection object, by trying to carry out copying one more time, or by carrying out a process (evasive measure) such as redoing the placement of the document and carrying out copying again or the like, there are many situations where it will be possible to correctly judged that the image is not a detection object, whereafter copying will finally be allowed. In this regard, because the object that is mis-recognized is generally different than the object that has undergone tuning for correctly carrying out recognition, most mis-recognitions occur at the branching point of a subtle judgment. Accordingly, due to such factors as dispersion of each document scan of the copying machine, the occurrence of a quantization error at the time of digital

processing and the like, there are many situations where only a slight change of the input image will cause the judgment conditions to become unrealized. Further, even when such evasive measure is carried out for a detection object such as a banknote or the like, and even when there are slight changes and the like of the image, it is possible to carry out recognition.

For this reason, in a closed image processing system such as a copying machine or the like, the act of carrying out a process such as retrying copying a plural number of times or redoing the placement of the document or the like will have almost no adverse effect on correct recognition, and this forms an evasive measure only for mis-recognition.

On the other hand, with the advent of high-performance, low-cost image scanners, personal computers, printers and the like in recent years, counterfeiting on open systems has become a social problem. Namely, a genuine document is read in using an image scanner, and this read-in image data is stored in a personal computer. Then, the image data stored in the personal computer is supplied to a color printer. Then, this color printer forms images for output based on the received image data, and carries out a printout.

In such case, the image data stored in the personal computer can be sent from a scanner connected to the personal computer, acquired via communication, or supplied via a recording medium such as a FD, MO or the like. Accordingly, in this type of open system, image formation of image data having unknown origin is frequently carried out, and in such cases it is also necessary to stop outputs.

In one example method of stopping such improper outputs in open systems, the recognition device provided in prior art color copying machines or one of other various recognition devices is

installed in an image formation device such as a printer or the like. However, when this is done, the same problem of mis-recognition described above will occur.

Further, in order to solve such problem, the evasive measure in the copying machine described above can not be applied as is. Namely, the input of a color printer is not an object like a document for a copying machine, but is instead printer data in the form of electronic information. In other words, a document which is a physical object needs to first undergo conversion into electronic information in order to carry out copying. Accordingly, in the case of a copying machine, by redoing the placement of the document or the like at the time of such conversion, it can be expected that a dispersion will be created in the electronic information due to the main cause described above. However, the printing data is already converted into electronic information, and even when printing is tried again, the electronic information sent to the printer will remain completely unchanged.

For this reason, mis-recognitions will occur in color printers provided with an improper copying prevention device that uses image recognition, and even when an image is originally capable of being outputted, there are situations where such image will be recognized as a prohibited output item, and when a normal output is prohibited, thereafter, no matter how many times an output is retried for the same image, the result will be the same (i.e., a normal output will be prohibited). This arrangement not only causes needless stress for the user, but also places an excessive load on user support, and results in an increased cost for the product itself.

It is an object of the present invention to provide an image recognition device, an image forming device, and a recording medium which make it possible to receive data that has undergone

electronic information conversion, reduce the probability of mis-recognition even in the case where a recognition process is carried out on such data, and recognize that an image is not a detection object in the case where the image is not a detection object when a recognition process is carried out at least a plurality of times on the same image data.

SUMMARY OF THE INVENTION

The image recognition device according to the present invention is constructed so as to be equipped with a fluctuation producing portion which produces fluctuation information for changing recognition results, and an image recognition portion which carries out an image recognition process on supplied image data by taking into account the fluctuation information produced by said fluctuation producing portion.

As an example of specific solution means, the image recognition device is equipped with a fluctuation superimposing portion which superimposes fluctuation information produced by a fluctuation producing portion onto supplied image data, an image recognition portion which carries out an image recognition process on the superimposed image data having fluctuation information superimposed thereon created by said fluctuation superimposing portion, and an output portion which outputs recognition results of said image recognition portion.

Further, as other solution means, the image recognition device is constructed so as to be equipped with a recognition dictionary for carrying out an image recognition process on supplied image data, a fluctuation superimposing portion which superimposes fluctuation information produced by a fluctuation producing portion onto said recognition dictionary, an image recognition portion which carries out an image recognition

process on said supplied image data based on the fluctuation recognition dictionary created by the fluctuation superimposing portion, and an output portion which outputs recognition results of said image recognition portion.

Of course, the present invention is not limited to the structures described above, and so long as fluctuation information is produced and an image recognition process is carried out based on such produced fluctuation information, the fluctuation information may be used anywhere, and other various methods may be employed.

Further, the recording medium according to the present invention is a recording medium which can be read by a computer and which stores a program that enables the computer to execute a fluctuation producing process which produces fluctuation information for changing recognition results, a process which acquires image data of a recognition object, a process which reads out a recognition dictionary for carrying out an image recognition process, and an image recognition process which is carried out on the acquired image data by taking into account said read out recognition dictionary and said produced fluctuation information.

In the case such as where image data that has undergone electronic information conversion is received and an image process such as a printout or the like is carried out, image data of the same image will be the same no matter how many times reception is carried out. However, for example, when a fluctuation is superimposed on the received image data, only the fluctuation portion will change in the image data that forms the recognition processing object supplied to the image recognition portion. Similarly, when a fluctuation is superimposed on dictionary data that forms the source at the time a recognition process is carried out, the dictionary data will change even when

the image data that forms the recognition processing object is the same. Further, in addition to these arrangements, by taking the fluctuation information into account, one portion of the image data of the processing object may be thinned out or supplemented to change the dimensional shape, whereby the image data of the actual recognition object is changed.

Accordingly, there are different recognition results for the same image data. Namely, even if an image that is not a detection object is mistakenly recognized as a detection object, when the present image recognition device carries out a recognition process on the image data a plurality of times, the fluctuation described above makes it possible to make the normal judgment that the image is not a detection object. On the other hand, in the case of a detection object, because a recognition process is carried out with the features for detecting the detection object originally held in the dictionary, it is possible to recognize a detection object even when there is a slight fluctuation.

Further, the "fluctuation" may be superimposed on all of the supplied image data or recognition dictionary data, or superimposed on a portion thereof. Further, the recognition results of the "image recognition portion" may be something that outputs judgment results of the matchability or similarity or the like with the detection object, or judgments up to the judgment of whether or not an image is a detection object can be carried out, and then such judgment results may be outputted. Further, in the case where judgments up to the judgment of whether or not an image is a detection object are carried out, the fluctuation is not taken into account in the processes up to the calculation of the matchability or the like, and by fluctuating the reference value used when carrying out such final judgment, it is possible to form

a recognition process that takes fluctuation information into account in accordance with the present invention.

Namely, in the case where an image recognition process is carried out on the same image data (electronic information) a plurality of times, when the image data of the processing object is not a detection object but forms an image that resembles the detection object, the effect of the fluctuation information creates a different final judgment result of whether or not the image is a detection object, and this forms the present invention.

Further, the image forming device according to the present invention is equipped with a device main body which carries out a prescribed image conversion process on supplied image data information, and carries out a prescribed printing process, wherein a prescribed image recognition device is provided, image data inputted into the image forming device is inputted into said device main body and said image recognition device, and the suitability of a normal output of said device main body is judged based on recognition results of said image recognition device.

In this way, it is possible to reliably prohibit a normal output for prohibited output items. Further, even if an image that is not a prohibited output item is mistakenly recognized as a prohibited output item and a normal output prohibition process is received, by executing printing a number of times, the effect of the "fluctuation" makes it possible to recognize that the image is not a prohibited output item, and a normal output is carried out.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a drawing showing an image processing system in which the present invention is provided.

Fig. 2 is a drawing showing a first embodiment of an image recognition device according to the present invention.

Fig. 3 is a drawing showing the internal structure of a fluctuation producing portion.

Fig. 4 is a drawing showing the internal structure of a fluctuation superimposing portion.

Fig. 5 is a drawing showing another example of the internal structure of a fluctuation superimposing portion.

Fig. 6 is a drawing showing a second embodiment of an image recognition device according to the present invention.

Fig. 7 is a drawing showing the internal structure of a fluctuation superimposing portion.

Fig. 8 is a drawing showing a system structure for implementing the recording medium according to the present invention.

Fig. 9 is a drawing showing a system structure for implementing the recording medium according to the present invention.

PREFERRED EMBODIMENTS OF THE INVENTION

The present invention will be described in detail with reference to the appended drawings.

Fig. 1 shows the schematic structure of an image processing system to which the present invention is applied. As shown in the drawing, the document to be read is imaged using a scanner 10 and image data is uptaked. The uptaked image data is transmitted to the main portion of a personal computer 20, and uptaked in an internal/external storage device of the personal computer 20. This personal computer 20 also serves as a print server and the like for a simple copying machine.

Further, a printer 30 which is an image forming device is connected to the personal computer 20, and after being edited by photo retouching software or the like, or with no editing being

carried out, the image uptaken in the personal computer 20 is outputted to the printer 30 for image formation, and then a printout can be carried out by printing onto a blank sheet.

Further, the final output of prohibited copying items such as banknotes and the like (prohibited output items) should be prevented, and the printer 30 is equipped with a printer main body 31 which has the essential function of a printer for carrying out printout, and an image recognition device 32, wherein the image recognition device 32 carries out a prescribed recognition process on image data supplied from the personal computer 20, calculates the matchability indicating the probability of a specific pattern printed on a prohibited output item, and then sends such matchability to the printer main body 31.

Then, in the printer main body 31, in the case where the received matchability is above a prescribed threshold value, the image data currently waiting to be outputted is judged to be a prohibited output item, and a prescribed output prohibition process is carried out. Various methods can be employed for this output prohibition process, such as painting a certain color over the entire sheet, carrying out printing with a warning message superimposed thereon, or cutting off the power supply to stop the output process itself, or the like.

Further, as for the output from the image recognition device 32, instead using the matchability in the manner described above, the image recognition device 32 may carry out judgments up to the judgment of whether or not an image is a prohibited output item based on the matchability, and then a prohibition command may be outputted in the case where an image is judged to be a prohibited output item. Furthermore, the relationship between the image recognition device 32 and the printer main body 31 described above can be the same as the relationship between the

image recognition device in a prior art copying machine and the copying machine main body.

In this regard in the present invention, the image recognition device 32 is constructed as shown in Fig. 2. Namely, image data uptaked via an image inputting portion 34 is supplied to a fluctuation superimposing portion 35, wherein superimposed image data is created by superimposing fluctuation data created by a fluctuation producing portion 36 onto the image data. This superimposed image data is supplied to a next-stage image recognition portion 37. The image recognition portion 37 carries out an image recognition process on the supplied superimposed image data based on dictionary data stored in a recognition dictionary 38. Namely, the probability (matchability) of a detection object is calculated, and the result is supplied to a recognition result outputting portion 39, and then the result is outputted to the printer main body 31 via the recognition result outputting portion 39.

When constructed in this way, for example even if the image data uptaked via the image inputting portion 34 is the same, because fluctuations are superimposed on such image data, only the fluctuation portions of the image data undergoing a recognition process by the image recognition portion 37 will change. Accordingly, in the case of a detection object, it is possible to recognize the detection object even when there is a slight fluctuation, and in the case where an item is not a detection object, for example even in the case where a detection object is mis-recognized one time, by trying to carry out a printout again, the "item is not a detection object" judgment will be correctly carried out, and then printout will become possible.

Now, the specific functions of each device described above are as follows below. The fluctuation producing portion 36

10038745.122101

produces an adequately strong fluctuation (fluctuation information), and as shown in Fig. 3, the internal structure thereof includes a random number table 36a which stores a list of random numbers in the form of a table, and a counter 36b which refers to such random number list. In this way, the fluctuation is determined based on random numbers from a table referenced by the counter 36b, and this fluctuation (value) is supplied to the fluctuation superimposing portion 35. In this regard, in the present example, any value within the range ± 7 is used.

Further, in the present embodiment, the random numbers are stored in advance in the form of a table, but the present invention is not limited to this arrangement, and it is of course possible to provide a random number generator that uses an algorithm such as, for example, a linear congruence method, M-series sequence or the like.

As shown in Fig. 4, the fluctuation superimposing portion 35 is equipped with adders 35a ~ 35c which add the fluctuation supplied from the fluctuation producing portion 36 to each color data of RGB supplied via the image inputting portion 34. Namely, the fluctuation value (fluctuation information) is simply added to each pixel density supplied in order. Further, although it also depends on the function of the fluctuation producing portion 36, the fluctuation value may be used in common (the same value is added to the RGB data for the same pixel) by each pixel unit, or a fluctuation value may be established for each RGB data.

Further, in the present embodiment, although a simple addition is carried out for the pixel density as described above, various other methods can be employed, such as using color signals and brightness signals, or using discrete cosine conversion or the like to superimpose only on a specific

frequency component, or the like. Further, the specific superimposing method is not limited to the simple addition described above, and it is possible to use various methods such as various operations involving the four rules of arithmetic or bit operations, or the like. In short, the fluctuation is supplied, and even when the input image data is the same, it is possible to make the image data undergoing image processing become different.

Further, instead of the structure described above, the fluctuation superimposing portion 35 can be constructed as shown in Fig. 5 for example. Namely, in the present embodiment, the fluctuation superimposing portion 36 outputs a value anywhere in the range 100 ~ 10,000 in accordance with the same principle described above. Further, this value anywhere in the range 100 ~ 10,000 forms fluctuation information X, and the fluctuation superimposing portion 35 thins out one pixel portion of the main scanning direction at the rate of one cycle for X cycles. In this way, the dimensional shape of the item that does not have different density values (color information) of each pixel undergoes a minute reduction within the range 0.01 ~ 1% . Namely, the size and shape of the recognition object changes each time (the pixel arrangement is disarranged), and this changes the image data of the recognition object.

Now, as for the specific structure for carrying out such process, first, an x counter 35d is provided to count the number of pixels of the x direction (main scanning direction) of the input image, and this count value is supplied to a comparator 35e. The comparator 35e is supplied with the fluctuation information (the value X anywhere in the range 100 ~ 10,000) produced by the fluctuation producing portion 36, and outputs a detection signal when two inputs match each other. In this way, a pulse is outputted from the comparator 35e at the rate of one cycle for X

cycles for the count value (the number of pixels of the main scanning direction) of the x counter 35d.

This output of the comparator 35e is supplied to a reset terminal of the x counter 35d, and one terminal (reverse input terminal) of an AND element 35f. Further, the other terminal of the AND element 35f is supplied with the input image.

In this way, normally, because the output of the comparator 35e is Low, the output of the AND element 35f is the same as the input image. Then, when a pulse is outputted from the comparator 35e at the rate of one cycle for X cycles, the input image at such time is not outputted, and the count value of the x counter 35d is reset. Further, the present invention is not limited to an arrangement for reducing in this way, and it is possible to employ various methods such as enlarging, rotating, inclining, deforming (parallelogram) or the like.

The image recognition portion 37 can include certain various recognition algorithms from the prior art, and in addition to cross-correlation and template matching and the like, it is possible to use various recognition methods. Further, in accordance therewith, the dictionary data stored in the recognition dictionary 38 also corresponds to the recognition algorithm, and this forms a dictionary suited to detection objects (prohibited output items). Furthermore, when the dictionary is matched with the recognition algorithm, it is of course necessary to establish a range of fluctuation values produced by the fluctuation producing portion 36 described above.

Namely, in the present embodiment, because a fluctuation is supplied for the images of the recognition processing object supplied to the image recognition portion 37, even when the same image data is supplied to the printer 30 and the image inputting portion 34 for example, the image data supplied to the image

recognition portion 37 will be different (the amount of change is small due to the "fluctuation").

Accordingly, for example, when attempting to print out normal image data that is not a prohibited output item, even if the image recognition portion 37 mistakenly recognizes (mis-recognizes) a prohibited output item, in the case where a printout of the same document is attempted again, from the fact that the fluctuation is superimposed, the recognition object image in the image recognition portion 37 will be different than the previous mis-recognized image, and this makes it possible to recognize that the image is not a prohibited output item, whereby a normal output is allowed. Of course, there is a possibility that a mis-recognition will occur two consecutive times, but from the fact that the recognition object will be different due to the fluctuation, by trying to carry out printing a number of times, it becomes possible to carry out a normal output.

On the other hand, in the case of a prohibited output item such as a banknote or the like, even when the fluctuation is superimposed and the image data of the recognition image object fluctuates slightly, there are changes in the read document itself which forms the source due to folds and the like that arise over time on banknotes and the like in the first place, and because the recognition algorithm and dictionary can be made to cope with such changes, it is possible to carry out detection without receiving adverse effects of the fluctuation described above, and a normal output can be prohibited.

Fig. 6 shows the essential portion of a second embodiment of the present invention. In the first embodiment described above, a fluctuation was supplied to the image data of the recognition object, but in the present embodiment, a fluctuation is supplied to the dictionary data supplied to the recognition

process function portion, more specifically the image recognition portion 37.

Namely, the output of the image inputting portion 34 is supplied without alteration to the image recognition portion 37. Then, as for the dictionary data supplied to the image recognition portion 37, a fluctuation produced by a fluctuation producing portion 36' is superimposed by a fluctuation superimposing portion 35' onto dictionary data stored in the recognition dictionary 38 to create fluctuation dictionary data, and this fluctuation dictionary data is supplied to the image recognition portion 37.

As for the fluctuation producing portion 36', it is possible to use basically the same elements as those of the fluctuation producing portion 36 and its modifications in the first embodiment. Further, the range of fluctuation values in the present embodiment is ± 7 , which is the same as that of the first embodiment, but it is of course possible to change this range depending on the dictionary recognition algorithm and the like.

Further, because the superimposing object is a dictionary, it is possible for the fluctuation superimposing portion 35' to add a specific parameter, for example a threshold value (a value represented by 8 bits for 256 gradations) at the time the image undergoes binary conversion. Namely, as shown in Fig. 7, a binary parameter (threshold value) supplied from the recognition dictionary and a fluctuation value supplied from the fluctuation producing portion are supplied to an adder 35'a, wherein both of these are added together, and then the result of such addition is supplied as a binary parameter to the image recognition portion 37. Of course, the parameter that is added is not limited to a binary threshold value.

Further, in the fluctuation superimposing portion 35', the fluctuation may be added to all of the dictionary data supplied from the recognition dictionary 38, or the fluctuation may be added to only one portion of the dictionary data. In such case, one portion of the dictionary data outputted from the recognition dictionary 38 is bypassed or sent through.

Then, the image recognition portion 37 compares the feature quantity (dictionary data) of the recognition object image and the feature quantity of the input image, and because the similarities and differences thereof are judged, whichever element the fluctuation is added to, an equivalent meaning will be held. Consequently, the present embodiment also achieves the same operational effect as that of the first embodiment, and prohibited output items such as banknotes and the like can be reliably recognized even when a printout is attempted a number of times, whereby a normal output is stopped. Further, in the case where an image is not a prohibited output item, by trying to carry out a printout at least several times, mis-recognition can be avoided, and a normal output becomes possible.

In both of the embodiments described above, the image recognition device was provided in an image forming device such as a printer or the like, but it is also possible to install the image recognition device as a printer driver or the like, or as driver of a peripheral device, wherein an image recognition algorithm is provided in such driver. Namely, the image recognition device of the present embodiments includes of course the case of being internally provided inside an image processing device which utilizes recognition results, and also includes the case of being provided outside the image processing device such as when the image processing device is a peripheral device and the image recognition device is provided inside a computer.

Furthermore, in the embodiments described above, the programs and system were previously described with regard to the image recognition device (e.g., these are applied to an expansion board or the like, or recorded inside an IC of a ROM or the like in order to create a complete unit in the form of a device). However, the present invention is not limited to only a complete unit that forms a device in this way, and it is also possible, for example, to create programs for a computer to execute each of the processes described above, and then such programs can be supplied by being recorded on a prescribed recording medium.

Namely, the recording medium is a floppy disk (FD) 40 or CD-ROM 41 or the like, and the programs recorded on such recording medium are installed via a FD driver 42 or a CD-ROM driver 43 into an HD unit 45 connected to (internally provided in) a computer (personal computer) 44, and in this way, the computer 44 constructs the device described in the embodiments described above.

Further, it is also possible to install the image recognition device as a printer driver or the like, or as driver of a peripheral device, wherein an image recognition algorithm is provided in such driver. Namely, the image recognition device of the present embodiments includes of course the case of being internally provided inside an image processing device which utilizes recognition results, and also includes the case of being provided outside the image processing device such as when the image processing device is a peripheral device and the image recognition device is provided inside a computer.

Further, by having the computer execute the installer stored on the recording medium 40, 41, it is possible to install all of the recognition program or a portion thereof into a peripheral device. Namely, the reading capabilities of the computer include of

course the case where installation is carried out in the computer itself, and also includes the case where the program read by the computer is installed in a peripheral device.

Furthermore, in the case where a device for reading a recording medium such as a FD drive, CD-ROM drive or the like is provided in various image processing devices such as a printer and the like, the present invention can also be applied to an arrangement in which a recording medium is inserted into the reading device to enable the program stored on the recording medium to be read into the image processing device (image forming device, image reading device, etc.) that will execute such program. Namely, because a CPU or one-chip microcomputer or the like is also provided in the printer or the like, in such case, a computer for the purpose of reading programs is present inside the printer.

INDUSTRIAL APPLICATION

As described above, in the image recognition device, the image forming device and the recording medium according to the present invention, even in the case where data that has undergone electronic information conversion is received, and a recognition process is carried out thereon, by supplying a fluctuation to the image data of the recognition object or the dictionary data for carrying out recognition, the probability of carrying out a mis-recognition is reduced, and when a recognition process is carried out at least a plural number of times on the same image data, in the case where an image is not a detection object, it is possible to correctly recognize that the image is not a detection object.

10/018749

531 Rec'd PCT

21 DEC 2001

ART 34 AMDT

FORMAL AMENDMENT

(Amended in accordance with Article 34)

CLAIMS

1. (Amended) An image recognition device for preventing counterfeiting of prohibited copying documents such as banknotes and valuable securities and the like, comprising:

a fluctuation producing portion which produces fluctuation information for changing recognition results in order to avoid mis-recognition which is caused by mistakenly recognizing an object that is not a detection object as being a detection object; and

an image recognition portion which carries out an image recognition process on supplied image data by taking into account the fluctuation information produced by said fluctuation producing portion.

2. An image recognition device, comprising:

a fluctuation superimposing portion which superimposes fluctuation information produced by a fluctuation producing portion onto supplied image data;

an image recognition portion which carries out an image recognition process on the superimposed image data having fluctuation information superimposed thereon created by said fluctuation superimposing portion; and

an output portion which outputs recognition results of said image recognition portion.

3. An image recognition device, comprising:

a recognition dictionary for carrying out an image recognition process on supplied image data;

a fluctuation superimposing portion which superimposes fluctuation information produced by a fluctuation producing portion onto said recognition dictionary;

an image recognition portion which carries out an image recognition process on said supplied image data based on the fluctuation recognition dictionary produced by the fluctuation superimposing portion; and

an output portion which outputs recognition results of said image recognition portion.

4. An image forming device equipped with a device main body which carries out a prescribed image conversion process on supplied image data information, and carries out a prescribed printing process, wherein:

the image recognition device of any one of said Claim 1 ~ Claim 3 is provided,

10018749-122101

and image data inputted into the image forming device is inputted into said device main body and said image recognition device; and

the suitability of a normal output of said device main body is judged based on recognition results of said image recognition device.

5. A recording medium which can be read by a computer and which stores a program that enables the computer to execute:

a fluctuation producing process which produces fluctuation information for changing recognition results;

a process which acquires image data of a recognition object;

a process which reads out a recognition dictionary for carrying out an image recognition process; and

an image recognition process which is carried out on the acquired image data by taking into account said read out recognition dictionary and said produced fluctuation information.

1001221-643001

1/6

FIG. 1

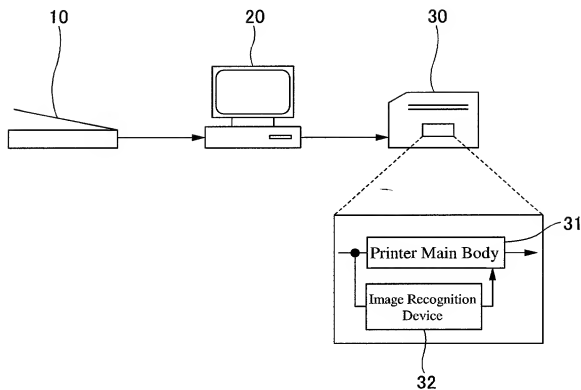
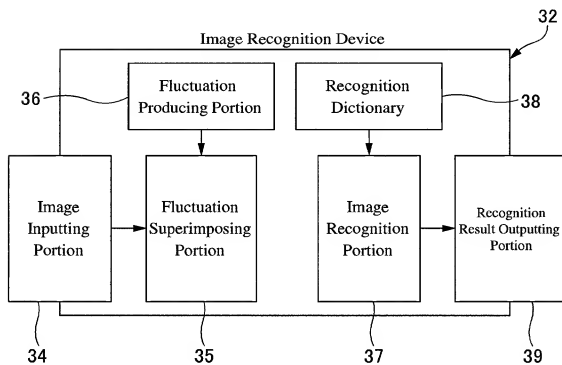


FIG. 2



2/6

FIG.3

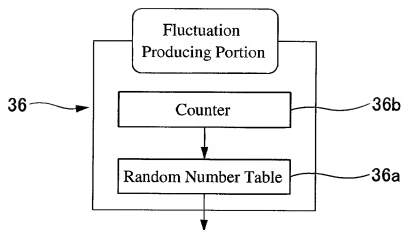
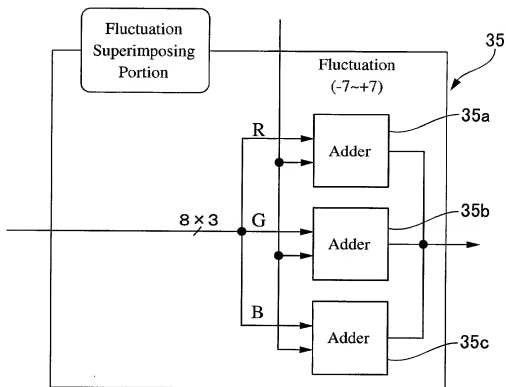


FIG.4



3/6

FIG.5

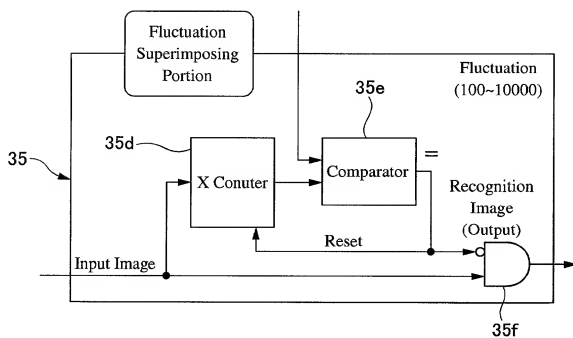
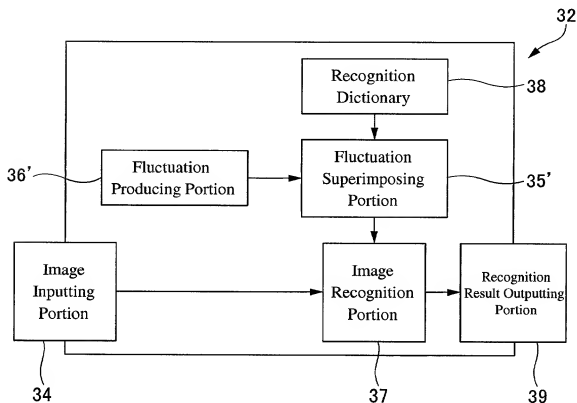
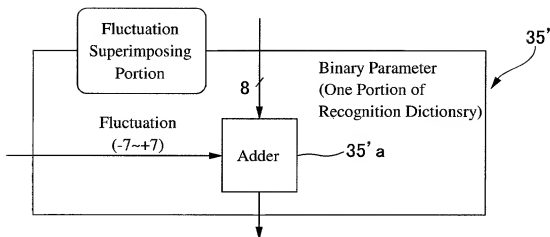


FIG.6



4/6

FIG. 7



5/6
FIG.8

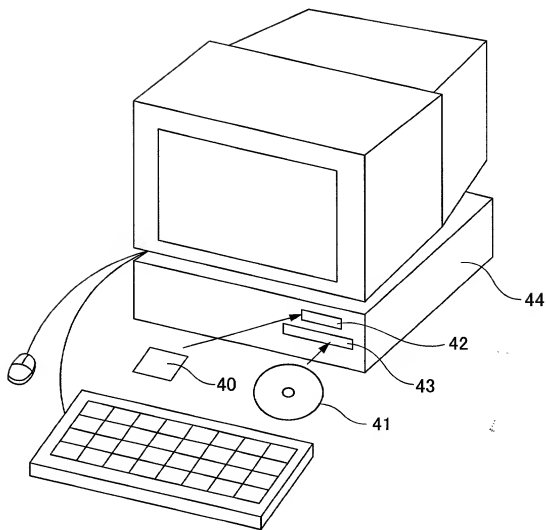
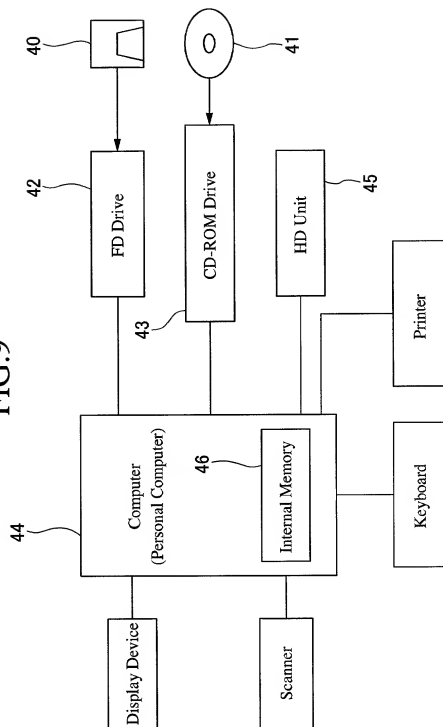


FIG. 9



Declaration and Power of Attorney for Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

私は、以下に記された発明者として、ここに下記の通り宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先として同欄は、私の氏名の後に記載された通りである。

My residence, post office address, and citizenship are as stated next to my name.

下記の名称の権利について、特許請求権に記載され、且つ特許が認められている発明事項に関して、私は、最初、最先かつ唯一の発明者である（唯一の氏名が記載されている場合）か、あるいは最初、最先かつ共同発明者である（複数の氏名が記載されている場合）と信じている。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

IMAGE RECOGNITION DEVICE,
IMAGE FORMING DEVICE,
AND RECORDING MEDIUMIMAGE RECOGNITION DEVICE,
IMAGE FORMING DEVICE,
AND RECORDING MEDIUM

上記権利の明細書はここに添付されているが、下記の箱がチェックされている場合は、この限りでない：

the specification of which is attached hereto unless the following box is checked:

の日に出版され、
この出願の米国出願番号またはPCT国際出願番号は、was filed on _____
as United States Application Number or
PCT International Application Number

であり、且つ

and was amended on _____

(if applicable)

の日に修正された出願（該当する場合）

私は、上記の修正欄によって修正された、特許請求権を含む上記明細書を検討し、且つ内容を理解していることをここに表明する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則第37条第1.56に定義されている、特許性について重要な情報と開示する義務があることを認める。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

《日本經濟叢書》

私は、ここに、以下に記載した外国での特許出願または発明者証の出願、あるいは米国以外の少なくとも一国を指定して出願した米国が第3条3款第3段5条(以下)で示すPCT国際出願について、何第11条第(1)項又は第3段5条(以下)項に達して優先権を主張するとともに、優先権を主張する本出願の出発日より優先の出発日に有する外国での特許出願または発明者証の出願、あるいはPCT国際出願については、いかなる出願も、下記の枠内を越えることにより示した。

I hereby claim foreign priority under Title 35, United States Code Section 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365 (a) of any PCT International application which designated at least one country other than the United States listed below and have also identified below, by checking the box, any foreign application for patent, or inventor's certificate, or PCT International application having a filing date before that of the application for which priority is claimed.

Prior Foreign Application(s)

外国での先行出題

11-188357

Number)

JP

(Country)

02/07/99

(Day/Month/Year Filed)

《出版日／期／版》

2000-062134

Number:

JP

(Country)

07/03/00

(Day/Month/Year Filed)

(創刊号、5、6号)

私は、ここに、下記のいかなる米國並特許出願についても、その米國法典第35編119条(a)項の利益を主張する。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below

(Application No.)

《席間談話》

(Filing Date)

(出版日)

(Application No.)

《张闻天集》

(Filing Date)

《出版行》

私は、ここに、下記のいかなる米国の国益、又は、その米国の法律第35条第12項に基づく利益とを主張し、又は、これを支持するにかなるPCT国際出願に基づく利益、その米国の35条4(c)に基づく利益とを主張する。また、本出願の各特許請求の範囲の主題が、本米国の法律第35条第12項に規定された各特許で、先行する米国の国益又はPCT国際出願に開示されたいかなる場合においても、その各特許出願の公開日と本国内部公開日またはPCT国際出願日との間の期間中に入手された技術で、又は権利化されたPCT第37条規則1、5に規定された特許性に関与する従属特許として開示されるがあることを承認する。

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.)

(附錄三)

(Filing Date)

《出塞行》

(Status Patented, Pending, Abandoned)

(環境：特許許可、係属中、放棄)

(Application No.)

(附 录)

(Filing Date)

(水鏡月)

(Status Patented, Pending, Abandoned)

〔類況〕：特許許可、係屬中、放棄

私は、ここに表明された私自身の知識に依る叙述が眞實であり、
 若干補綴と信ずることに基づく叙述が、眞實であると信ぜらるることを
 希望し、さらに、虚妄の叙述などを行った場合には、米国連邦
 第1801条第1001条に基づき、罰金または拘留、若しくはその両方
 により処罰される、またそのような虚妄による虚偽の叙述は、本出版
 またはそれに對して発行されるいかなる特許も、その有効性に問題が生
 ずることを喚起した上で、叙述が行なれたことを、ここに宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Japanese Language Declaration

(日本語宣言書)

委任状: 私は本出願を審査する手続を行い、且つ米国特許権取得のための費用を遂行するために、記名された発明者として、下記の弁護士及び/または特許士を任命する。(氏名及び登録番号も記載すること)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number).

Thomas J. D'Amico, 28,371

Thomas J. D'Amico, 28,371

書類送付先

Send Correspondence to:

DICKSTEIN SHAPIRO MORIN & OSHINSKY
LLP
2101 L Street NW
Washington, DC 20037-1526

DICKSTEIN SHAPIRO MORIN & OSHINSKY
LLP
2101 L Street NW
Washington, DC 20037-1526

直接電話連絡先: (氏名及び電話番号)

Direct Telephone Calls to:
(name and telephone number)

Thomas J. D'Amico, (202) 785-9700 (facsimile:
(202) 887-0689)

Thomas J. D'Amico, (202) 785-9700 (facsimile:
(202) 887-0689)

第一または第一発明者氏名

Takashi Kakiuchi

Full name of sole or first inventor

Takashi Kakiuchi

発明者の署名

日付

Inventor's signature

Date

Takashi Kakiuchi

November 29, 2001

住所

Kyoto, Japan

Residence

Kyoto, Japan

国籍

Japan

Citizenship

Japan

郵便の宛先

c/o UMRON CORPORATION
801 Minamifudodo-cho, Horikawahigashiiru
Shiokoji-dori
Shimogyo-ku, Kyoto-shi; Kyoto 600-8530; JAPAN

Post Office Address

c/o OMRON CORPORATION
801 Minamifudodo-cho, Horikawahigashiiru
Shiokoji-dori
Shimogyo-ku, Kyoto-shi; Kyoto 600-8530; JAPAN

第二または発明者がある場合、その氏名

Junji Hiraishi

Full name of second joint inventor, if any

Junji Hiraishi

第二共同発明者の署名

日付

Second inventor's signature

Date

Junji Hiraishi

November 29, 2001

住所

Kyoto, Japan

Residence

Kyoto, Japan

国籍

Citizenship

郵便の宛先

c/o UMRON Corporation
801, Minamifudodo-cho, Horikawahigashiiru,
Shiokoji-dori, Shimogyo-ku
Kyoto-shi; Kyoto 600-8530; JAPAN

Post Office Address

c/o OMRON Corporation
801, Minamifudodo-cho, Horikawahigashiiru,
Shiokoji-dori, Shimogyo-ku
Kyoto-shi; Kyoto 600-8530; JAPAN

(第三以下の共同発明者についても同様に記載し、署名を
すること)

(Supply similar information and signature for third and subsequent
joint inventors.)

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Keitaro Taniguchi		Full name of third joint inventor, if any	
発明者の署名	日付	Inventor's signature	Date
住所 Kyoto, Japan		Residence Kyoto, Japan	December 4, 2004
国籍 Japan		Citizenship Japan	
郵便の宛先 c/o Omron Corporation 801, Minamifudodo-cho, Horikawahigashiiru, Shiokoji-dori, Shimogyo-ku, Kyoto-shi; Kyoto 600-8530; JAPAN		Post Office Address c/o Omron Corporation 801, Minamifudodo-cho, Horikawahigashiiru, Shiokoji-dori, Shimogyo-ku, Kyoto-shi; Kyoto 600-8530; JAPAN	

		Full name of fourth joint inventor, if any	
発明者の署名	日付	Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

		Full name of fifth joint inventor, if any	
発明者の署名	日付	Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

		Full name of sixth joint inventor, if any	
発明者の署名	日付	Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	